CLAIMS

6. An extruded propellant material comprising:

a first propellant composition comprising:

an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said first propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, and

a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said first propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

said first propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a first and relatively slow burn rate measured at 25 kpsi;

a second propellant composition comprising

an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said second propellant, and chosen from the group consisting of 3,3-bis-

azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, and

a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said second propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

said second propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a second and relatively fast burn rate on the order of at least about three times faster than said first burn rate of said first propellant composition, as measured at 25 kpsi.

7. The propellant composition of claim 6, further comprising an explosive plasticizer comprising from about four percent to about seven percent by weight, based on the weight of said propellant composition, and chosen from the group consisting of 1,3,3-trinitroazetidine (TNAZ), butane-trio-trinitrate (BTTN), trimethylolethane trinitrate (TMETN), triethylene glycol dinitrate (TEGDN), bis,2,2-dinitropropylacetyl/bis2,2-dinitropropylformal (BDNPA/F), methylnitratoethylnitramine (methyl NENA), ethylnitratoethylnitramine (ethyl NENA), and combinations thereof.

8. The propellant composition of claim 6, wherein said second burn rate of said second propellant composition is at least about twenty-one inches per second (21.0 in./sec.) as measured at 25 kpsi.

9. The propellant composition of claim 6, wherein said first burn rate of said first propellant composition is below about five inches per second (5.0 in./sec.) as measured at 25 kpsi.

10. The propellant composition of claim 9, wherein said first burn rate of said first propellant composition is in the range of from about four and four-tenths inches per second (4.4 in./sec.) to about four and five-tenths inches per second (4.5 in./sec.) as measured at 25 kpsi.

11. The propellant composition of claim 6, wherein said second or faster burn rate of said second propellant composition is between about three and five times faster than said first or slower burn rate of said second propellant composition, as measured at 25 kpsi.

12. The propellant composition of claim 11, wherein said second or faster burn rate of said second propellant composition is about four and eight-tenths times faster than said first or slower burn rate of said second propellant composition, as measured at 25 kpsi.

13. A process for the preparation of a propellant composition material, comprising the steps of:

a. preparing a first propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said first propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said first propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a first propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a relatively slow burn rate measured at 25 kpsi;

cooling said first propellant composition to a temperature of from about fifty-five degrees Celsius (55° Celsius) to about ninety-one degrees Celsius (91° Celsius) to solidify said first propellant composition;

b. preparing a second propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said second propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said second propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a second propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a second and relatively fast burn rate on the order of about three times faster than said first burn rate of said first propellant composition as measured at 25 kpsi;

cooling said second propellant composition to a temperature of from about fifty-five degrees Celsius (55° Celsius) to about ninety-one degrees Celsius (91° Celsius) to solidify said second propellant composition;

c. mixing said first propellant composition and said second propellant composition, and extruding the mixture in a desired form.

14. An extruded propellant material prepared by the method of:

a. preparing a first propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said first propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said first propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a first propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a first and relatively slow burn rate measured at 25 kpsi;

cooling said first propellant composition to a temperature of from about fifty-five degrees Celsius (55° Celsius) to about ninety-one degrees Celsius (91° Celsius) to solidify said first propellant composition;

b. preparing a second propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said second propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said second propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a second propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a second and relatively fast burn rate on the order

c. mixing said first propellant composition and said second propellant composition, and extruding the mixture in a desired form.

14. An extruded propellant material prepared by the method of:

a. preparing a first propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said first propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said first propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a first propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a first and relatively slow burn rate measured at 25 kpsi;

cooling said first propellant composition to a temperature of from about fifty-five degrees Celsius (55° Celsius) to about ninety-one degrees Celsius (91° Celsius) to solidify said first propellant composition;

b. preparing a second propellant composition by:

heating an energetic oxetane thermoplastic elastomeric binder comprising from about five percent to about thirty percent by weight, based on the total weight of said second propellant, and chosen from the group consisting of 3,3-bis-azidomethyl-oxetane (BAMO), 3-azidomethyl-3-methyloxetane (AMMO), and combinations thereof, to a temperature of about ninety-five degrees Celsius (95° Celsius) or until said elastomeric binder melts, and

mixing into said elastomeric binder a high energy explosive filler comprising from about seventy percent to about ninety-five percent by weight, based on the weight of said second propellant, and chosen from the group consisting of hexanitrohexaazaisowurtzitane (CL-20), 1,3,3-trinitroazetidine (TNAZ), cyclotrimethylene trinitramine (RDX), and combinations thereof,

to form a second propellant composition having an impetus of at least about thirteen hundred joules per gram (1300 J/g) and a second and relatively fast burn rate on the order

of about three times faster than said first burn rate of said first propellant composition, as measured at 25 kpsi;

cooling said second propellant composition to a temperature of from about fifty-five degrees Celsius (55° Celsius) to about ninety-one degrees Celsius (91° Celsius) to solidify said second propellant composition;

c. mixing said first propellant composition and said second propellant composition, and extruding the mixture in a desired form.

15. The propellant composition of claim 14, further comprising an explosive plasticizer comprising from about four percent to about seven percent by weight, based on the weight of said propellant composition, and chosen from the group consisting of 1,3,3-trinitroazetidine (TNAZ), butane-trio-trinitrate (BTTN), trimethylolethane trinitrate (TMETN), triethylene glycol dinitrate (TEGDN), bis,2,2-dinitropropylacetyl/bis2,2-dinitropropylformal (BDNPA/F), methylnitratoethylnitramine (methyl NENA), ethylnitratoethylnitramine (ethyl NENA), and combinations thereof.